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(71) Applicant

Mitsubishi Denki Kabushiki Kaisha

(Incorporated in Japan)

2-3 Marunouchi 2-chome, Chiyoda-ku, Tokyo, Japan

(72) Inventors

Syuuji Saeki

Narumi Nakajima

(74) Agent and/or Address for Service

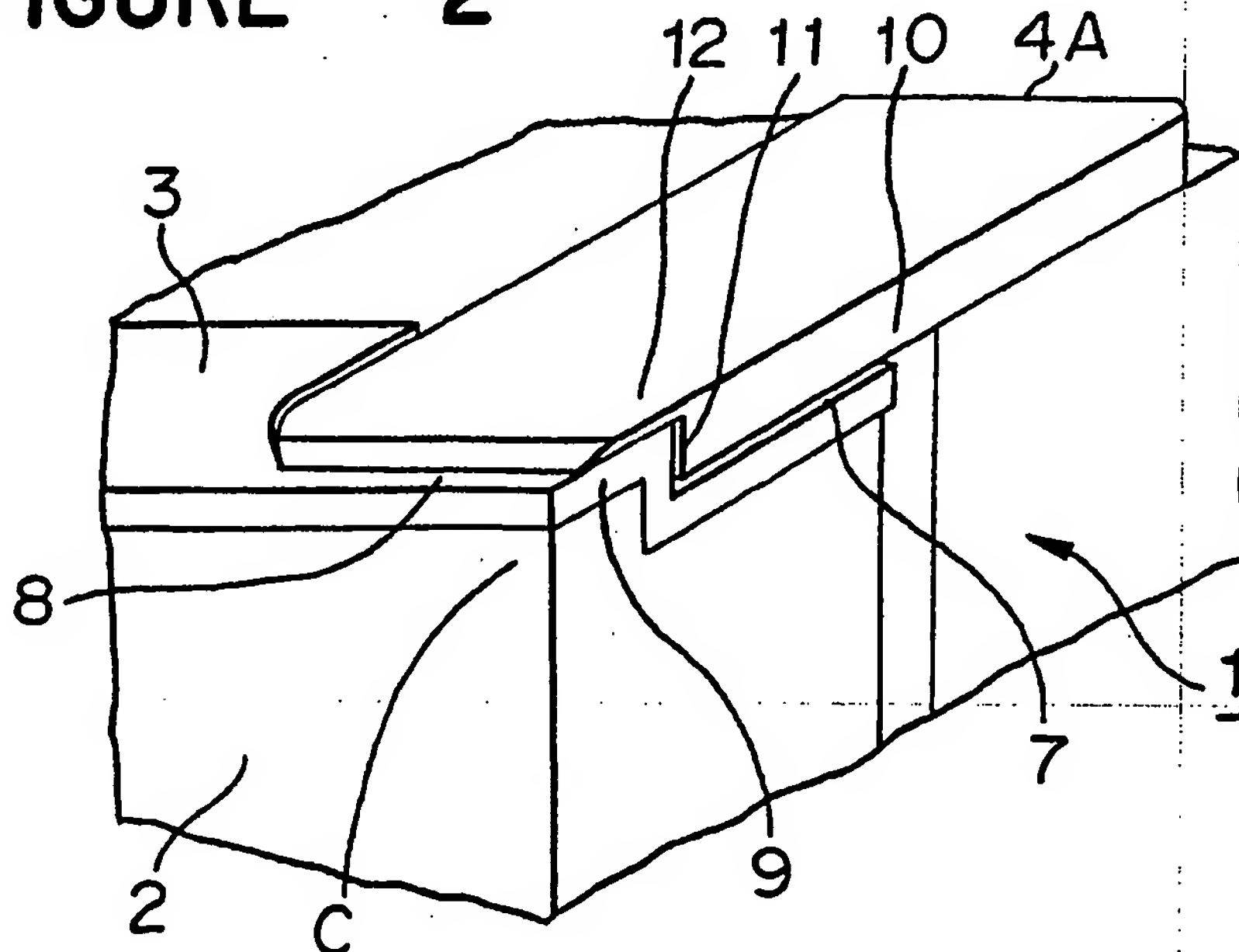
Marks & Clerk

57-60 Lincoln's Inn Fields, London, WC2A 3LS,
United Kingdom

(54) Hinge device

(57) A hinge device for a refrigerator door provided with a door frame 3 has a hinge cover which is located by a stepped portion 7 of the frame for swingably supporting the door on a hinge formed in a corner C of the door frame 3. A part of a front wall 8 of the door frame 3 and a part of a side wall 9 extending therefrom serve to hide the hinge. The hinge cover 4 has a top surface and a side surface, the top surface being formed on the substantially same plane as a top surface of the door frame 3, and the side surface having a cutout portion 11 formed on the substantially same plane as the side wall to correspond to a side surface of the stepped portion 7. In the hinge cover 4 is arranged a rib or a guide member for guiding and protecting an electric lead.

FIGURE 2



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FIGURE 1

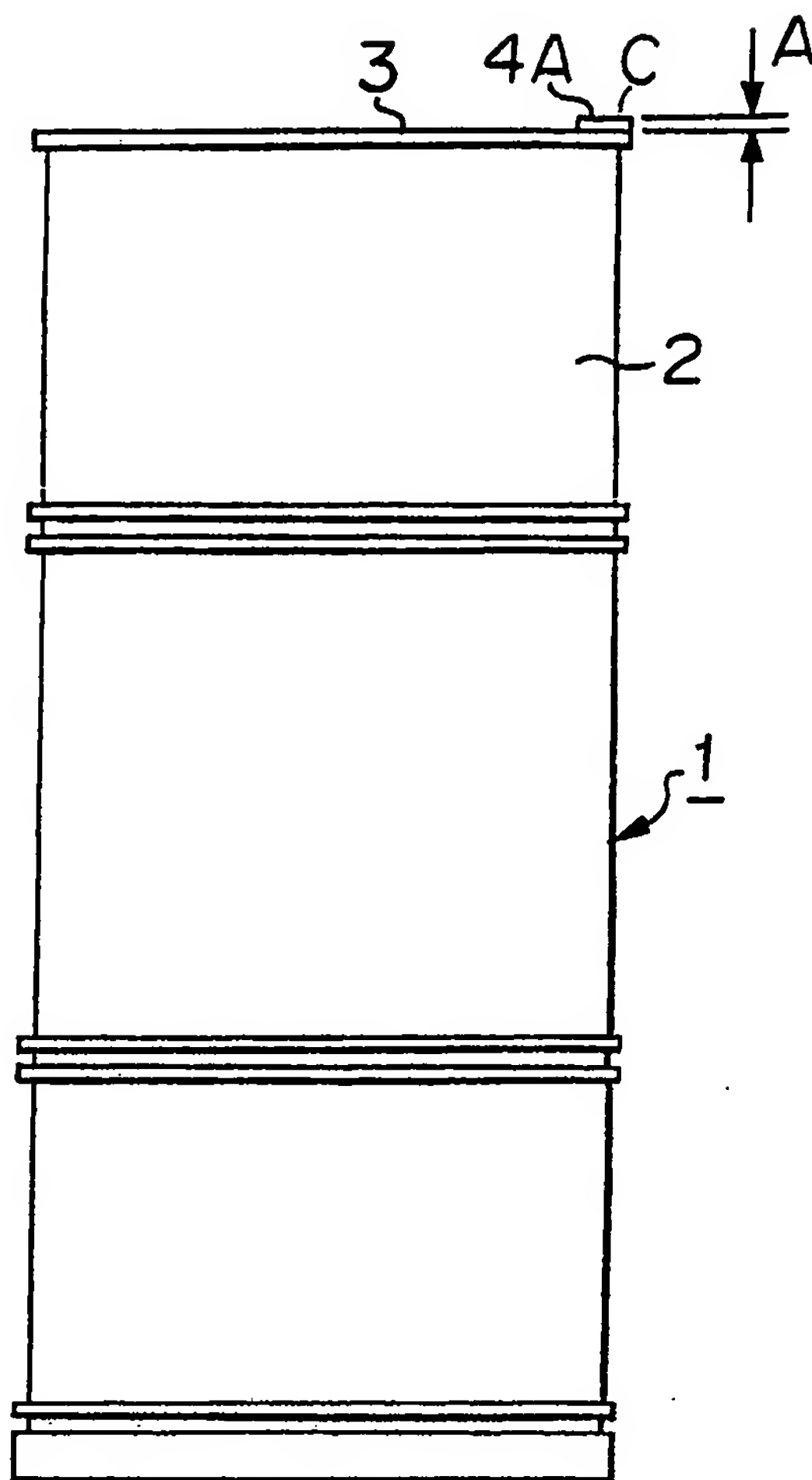


FIGURE 2

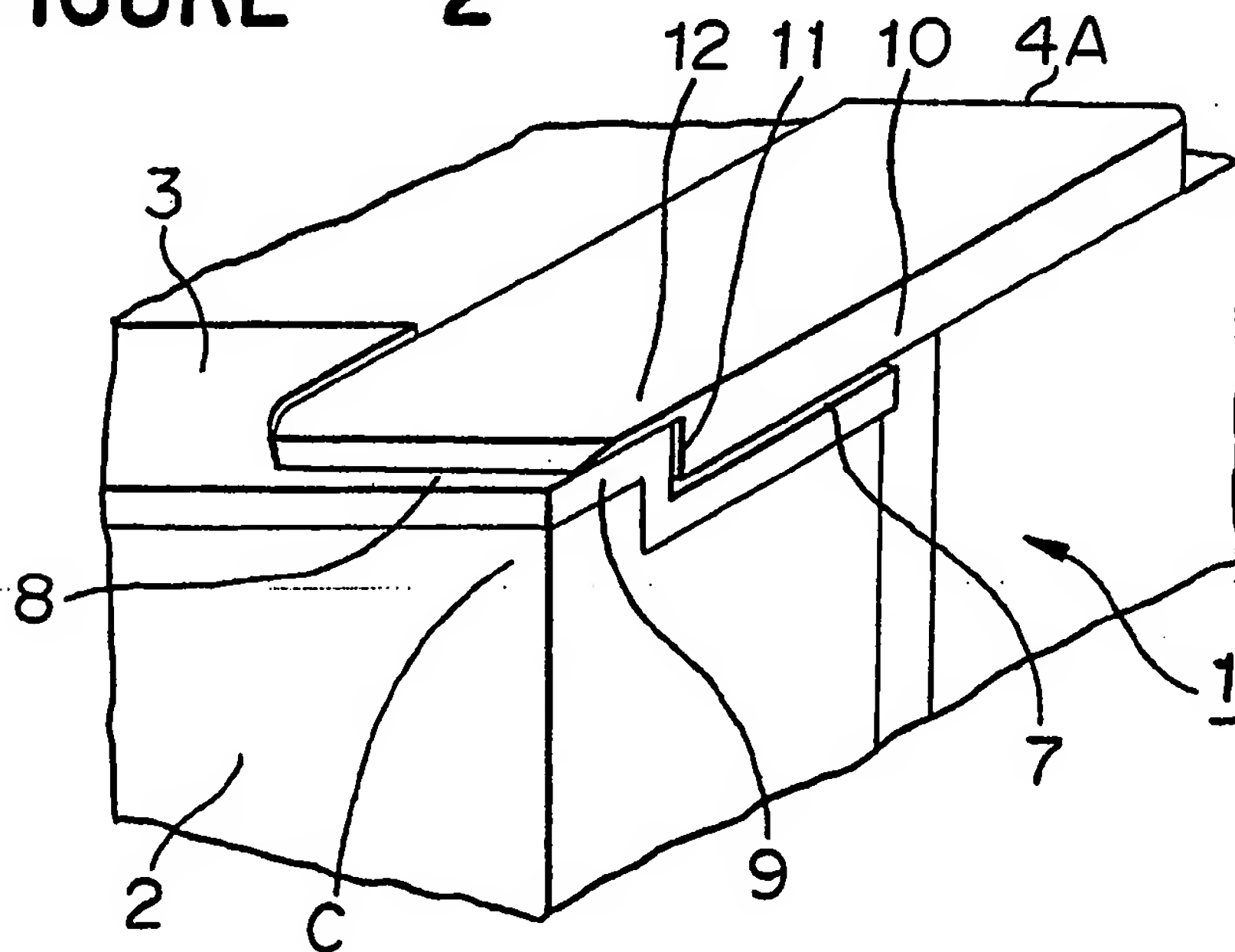


FIGURE 3

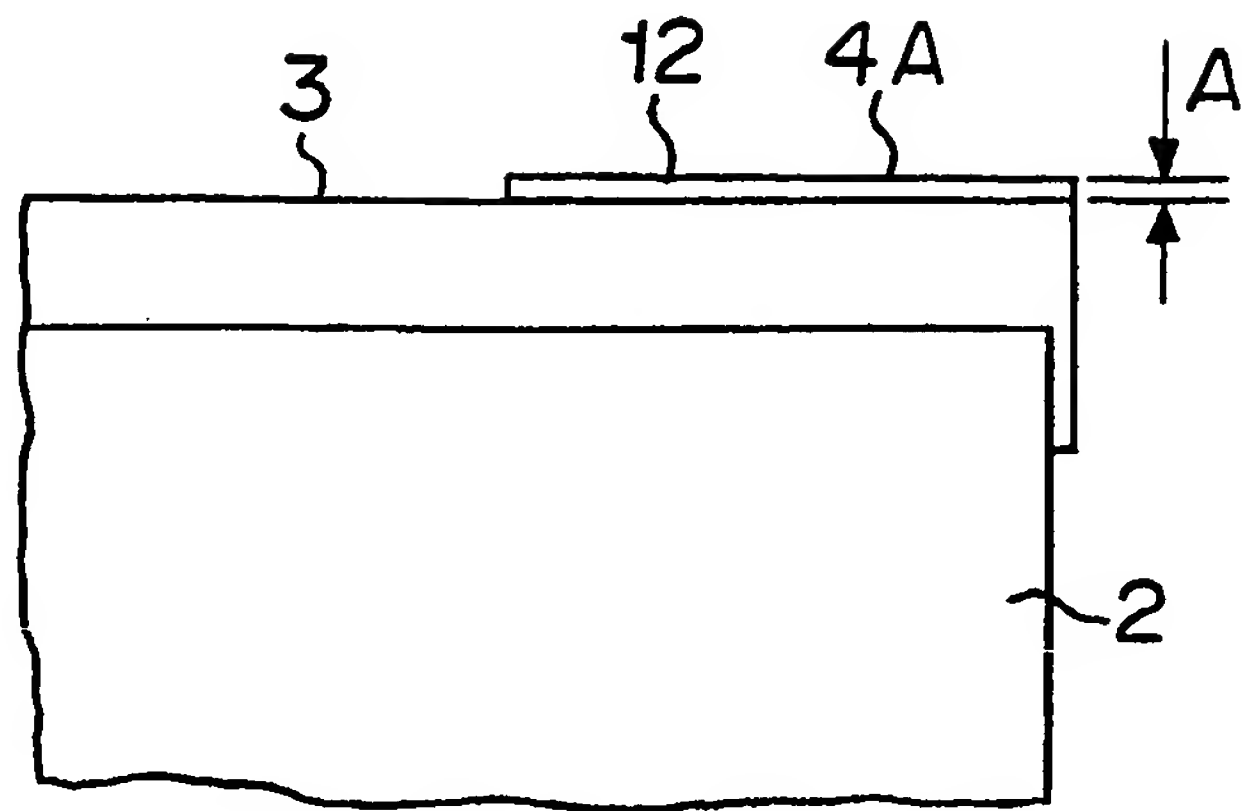


FIGURE 4

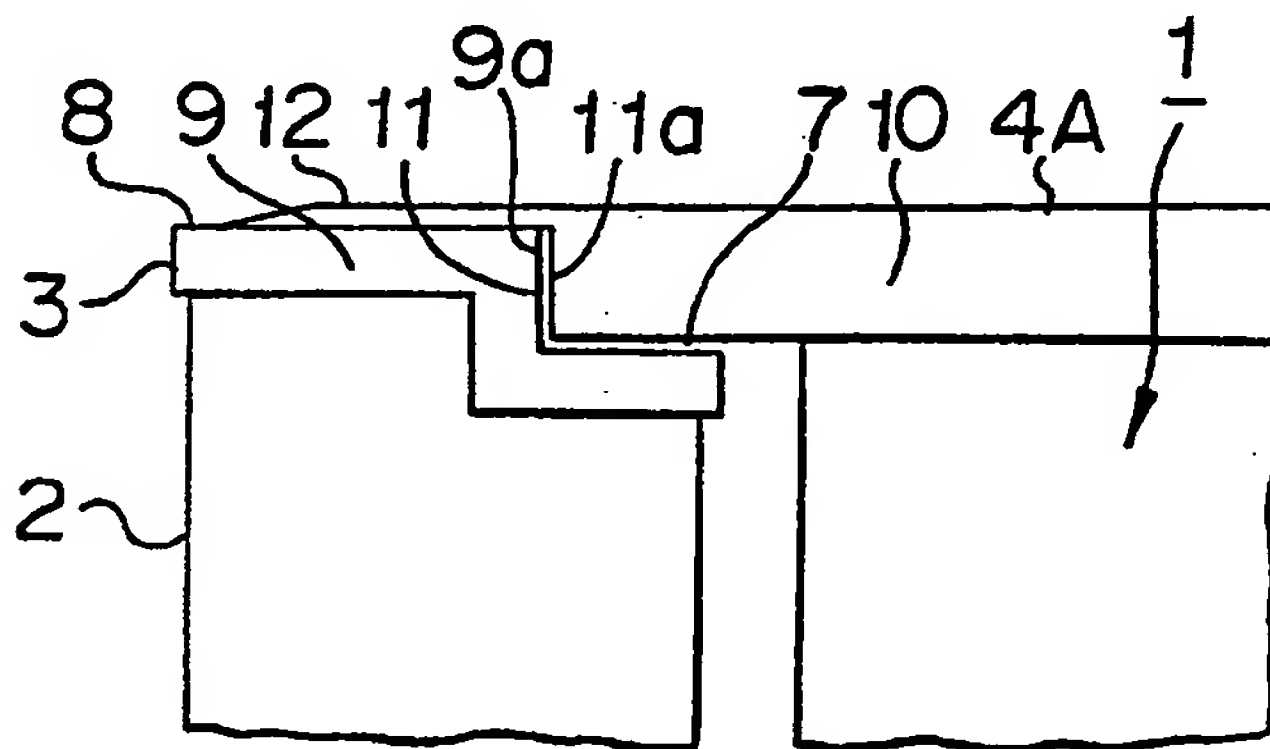


FIGURE 5

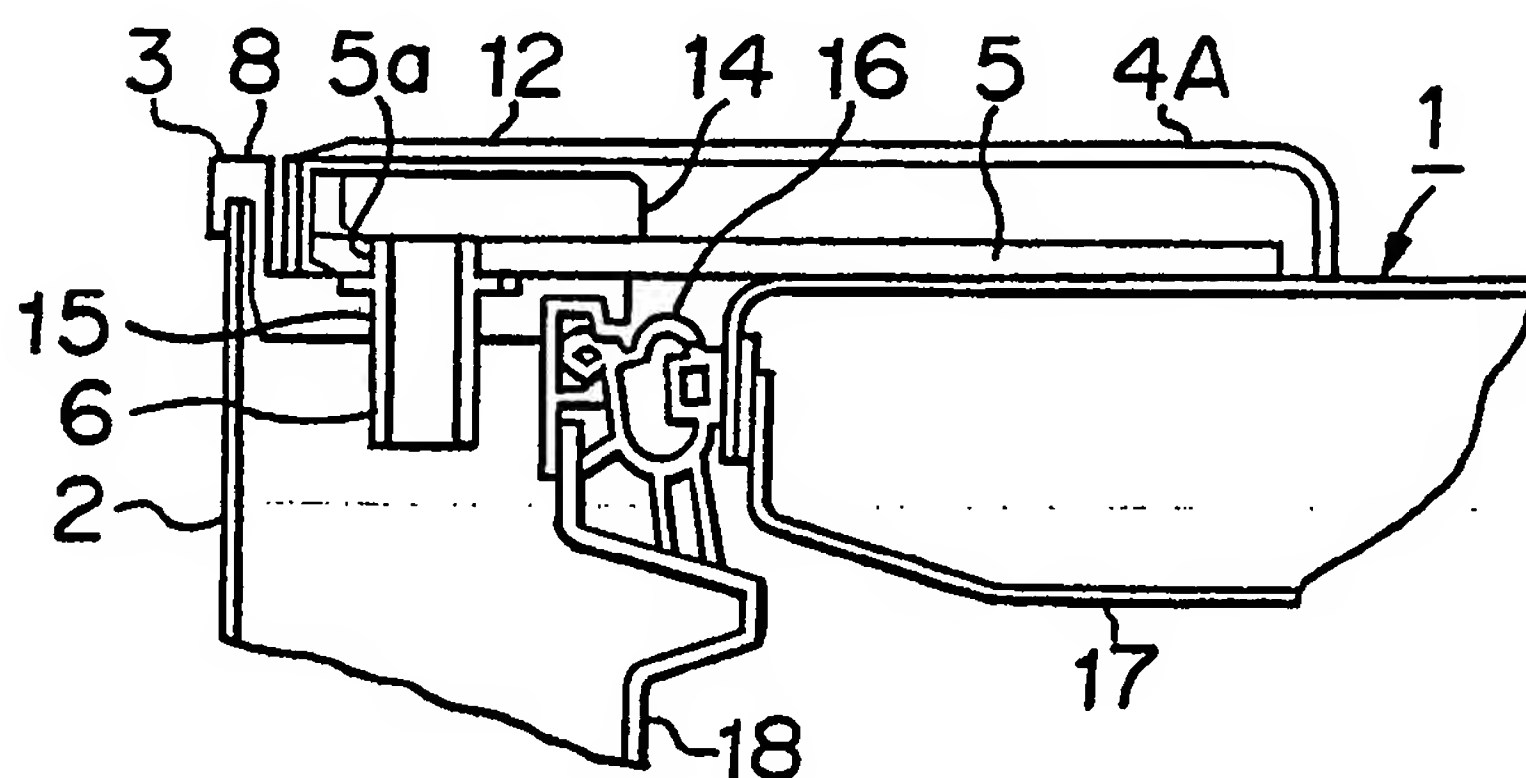


FIGURE 6

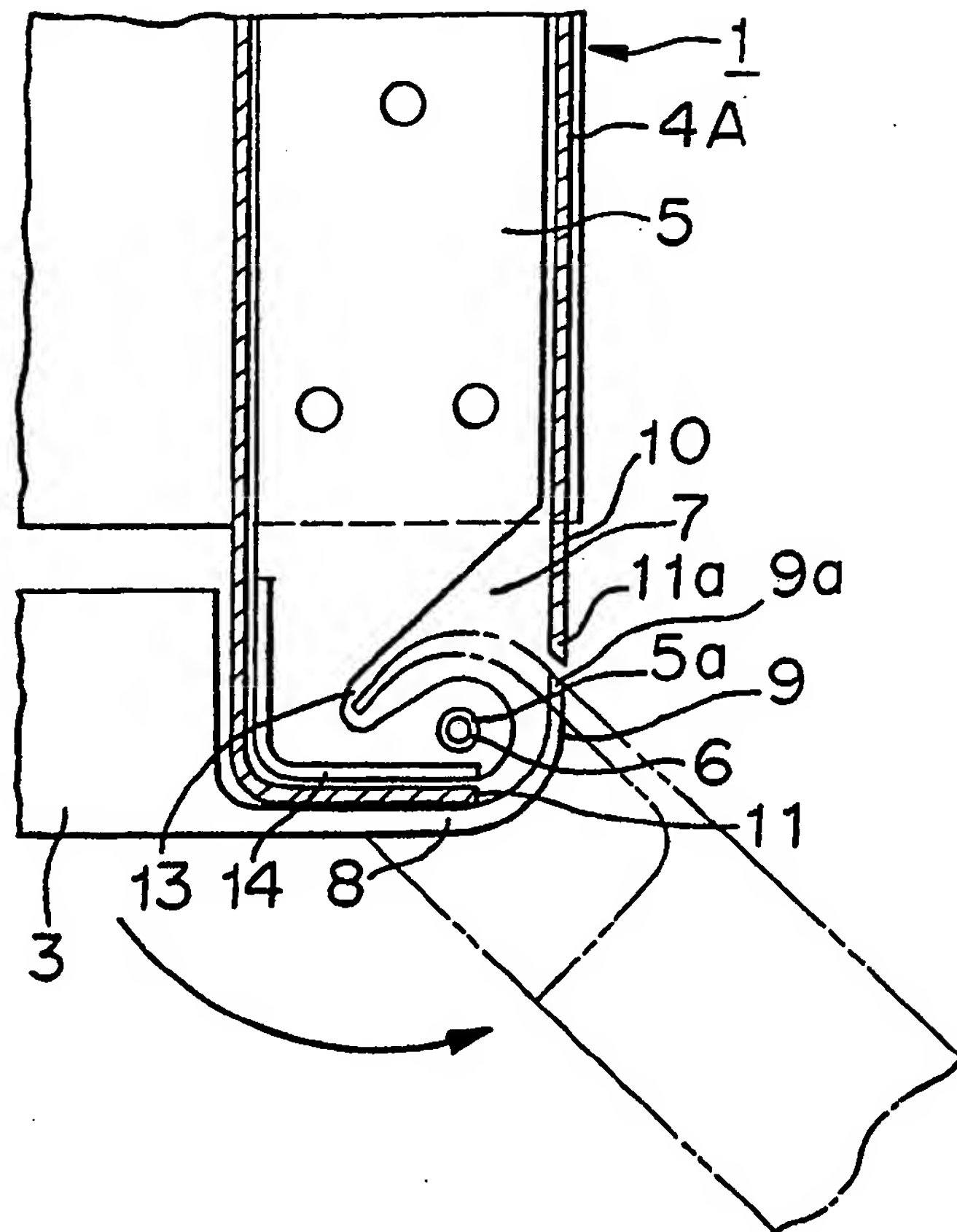


FIGURE 7

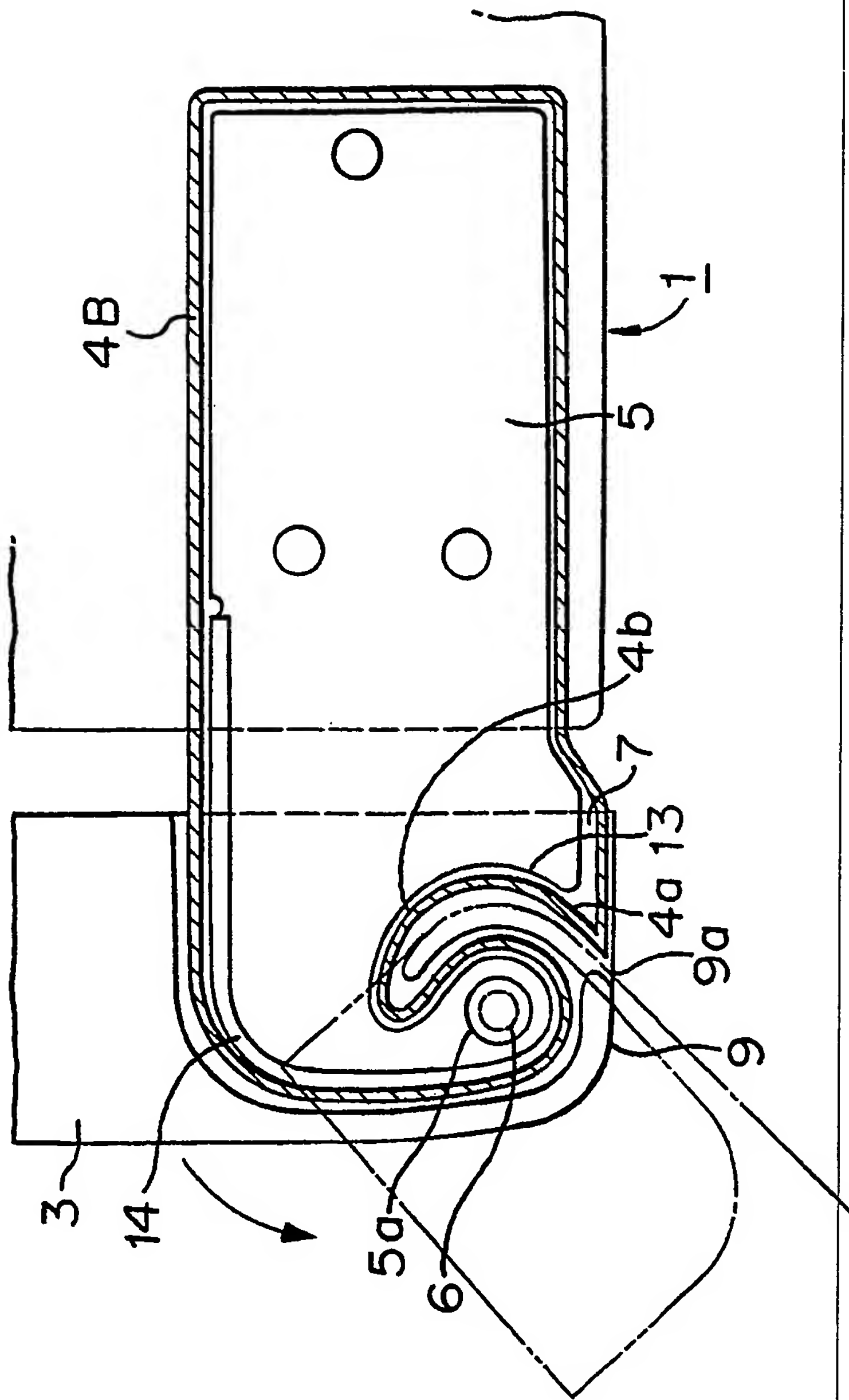


FIGURE 8

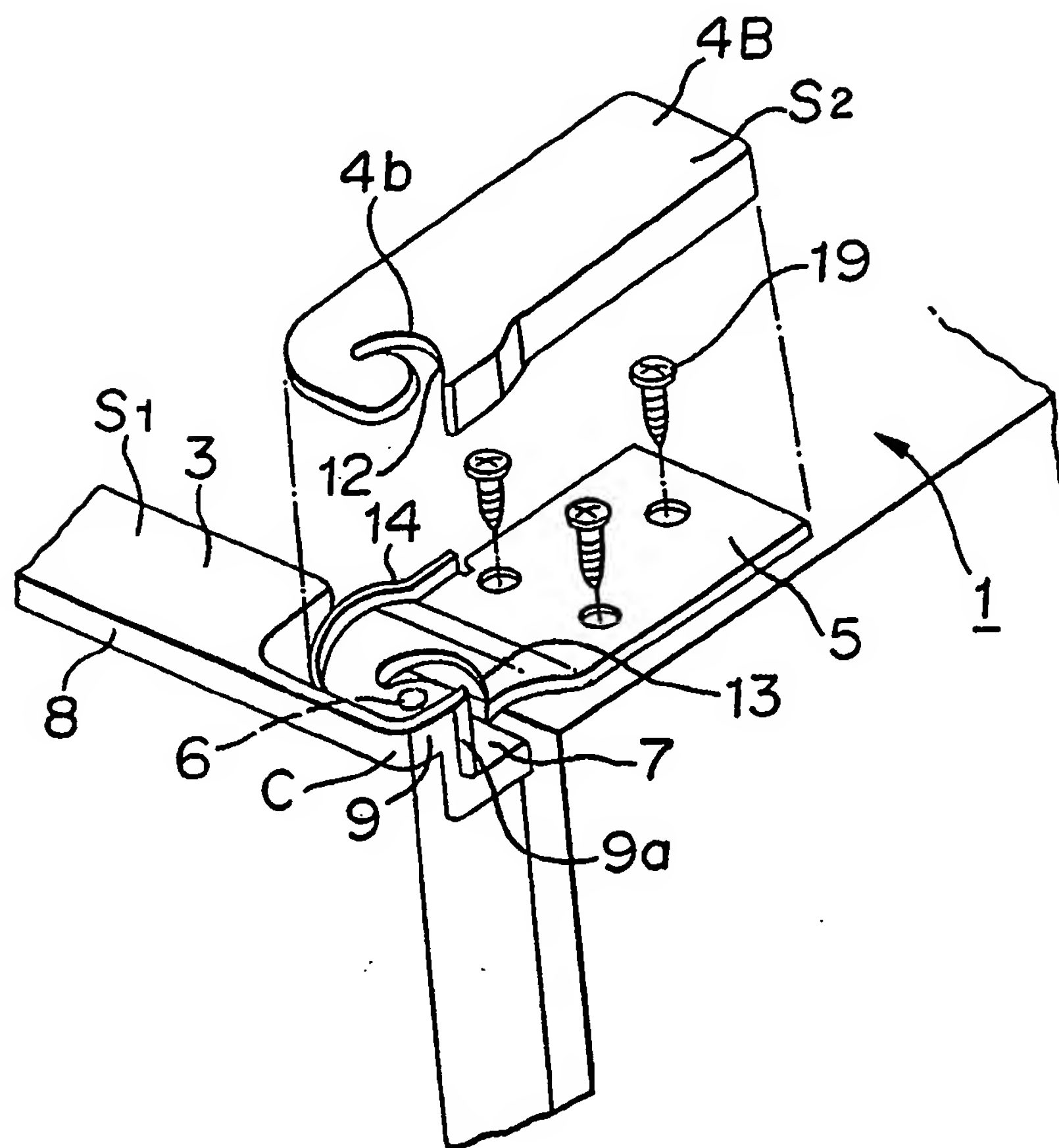
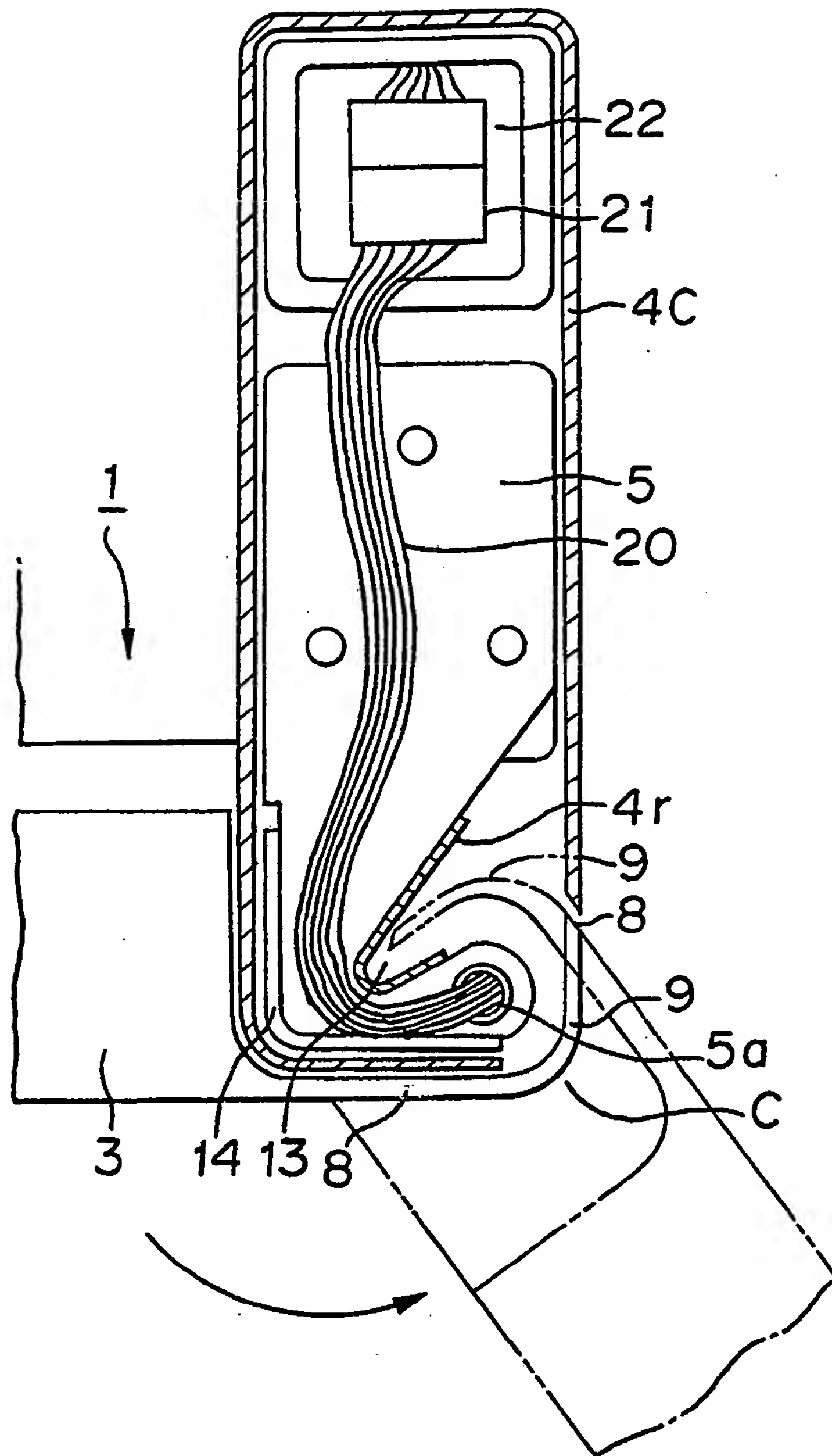


FIGURE 9

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FIGURE 10

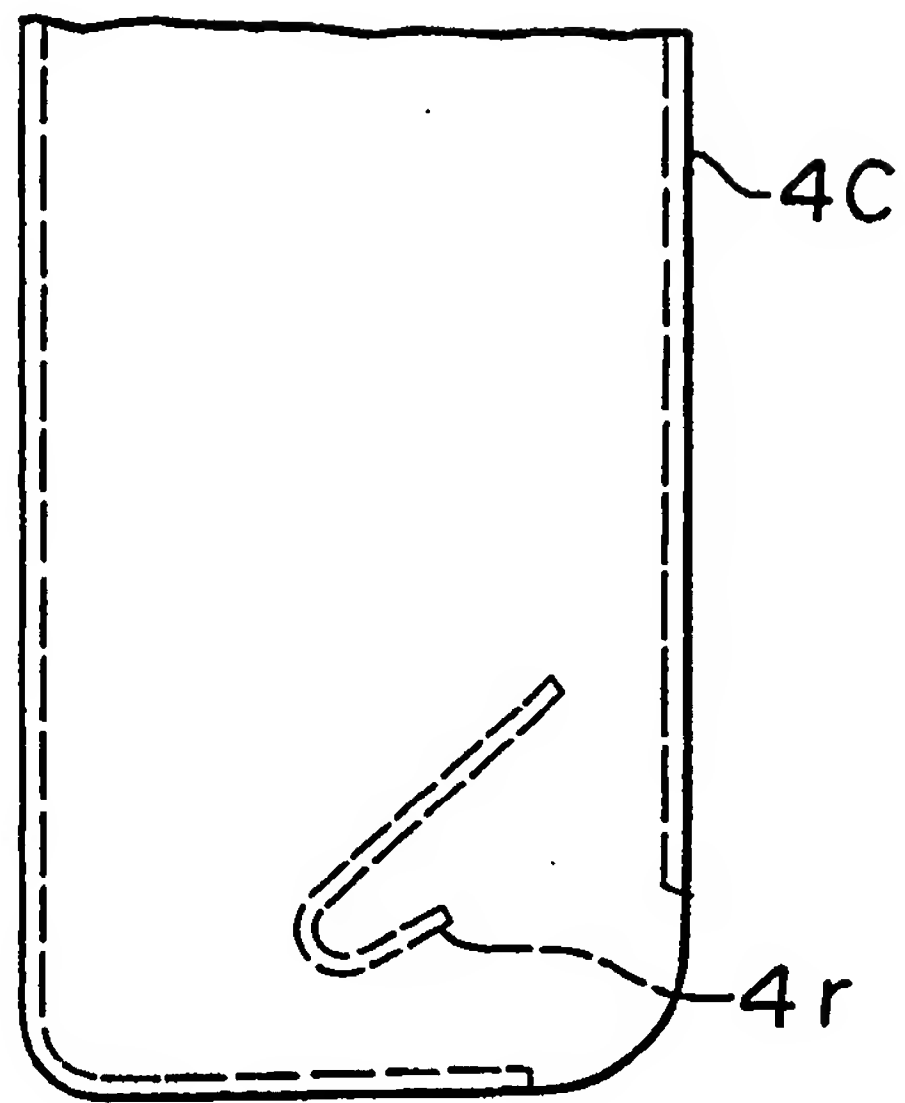


FIGURE 11

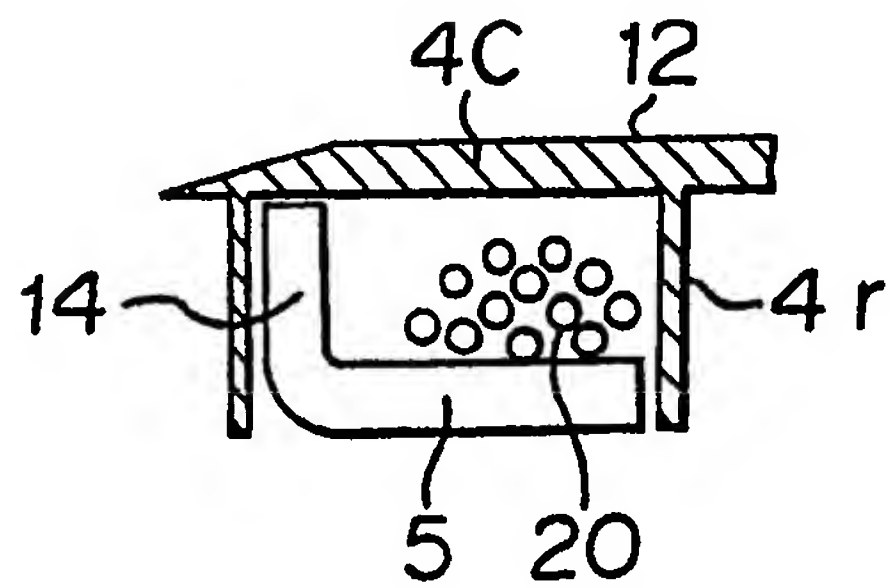
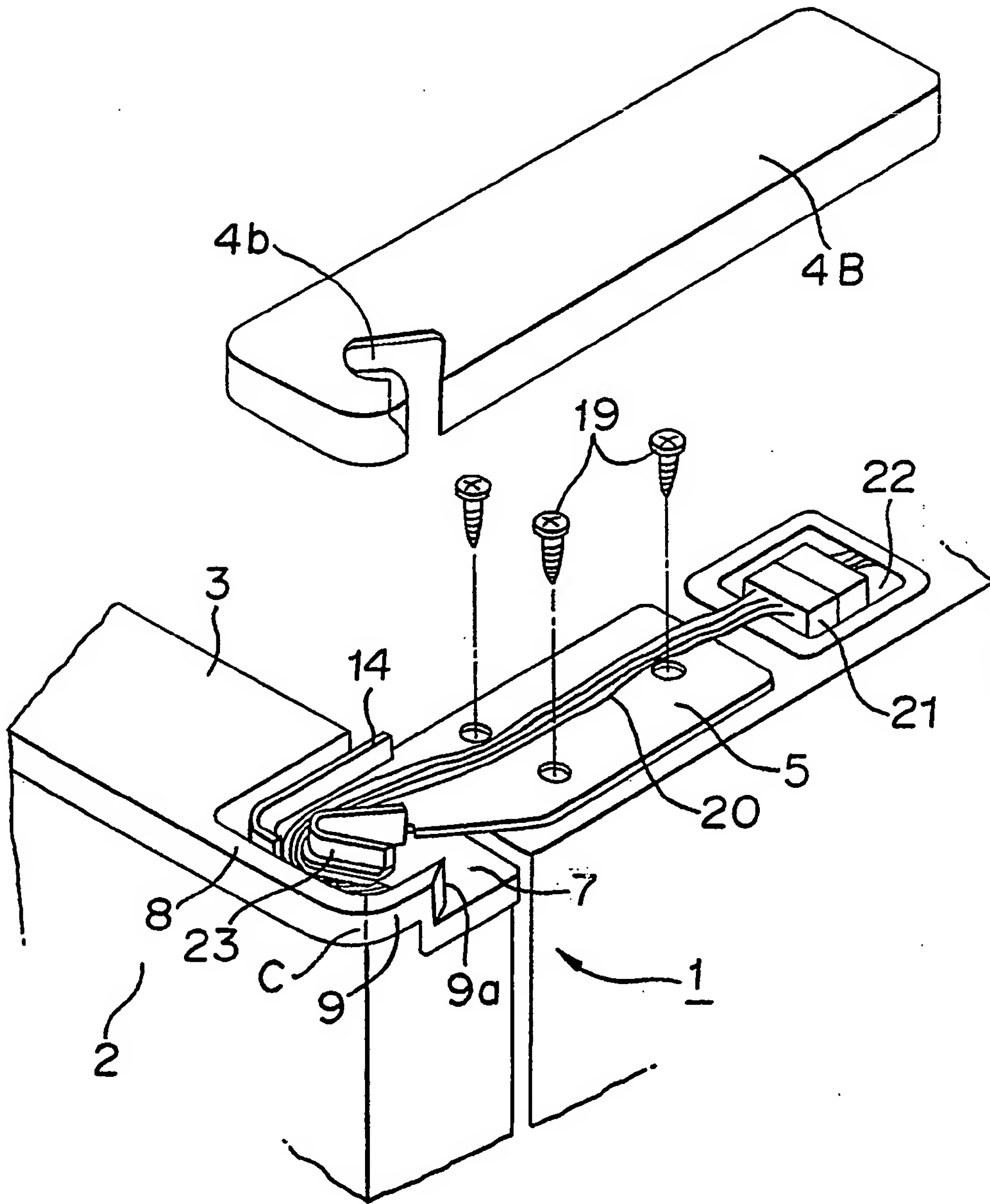


FIGURE 12



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FIGURE 13

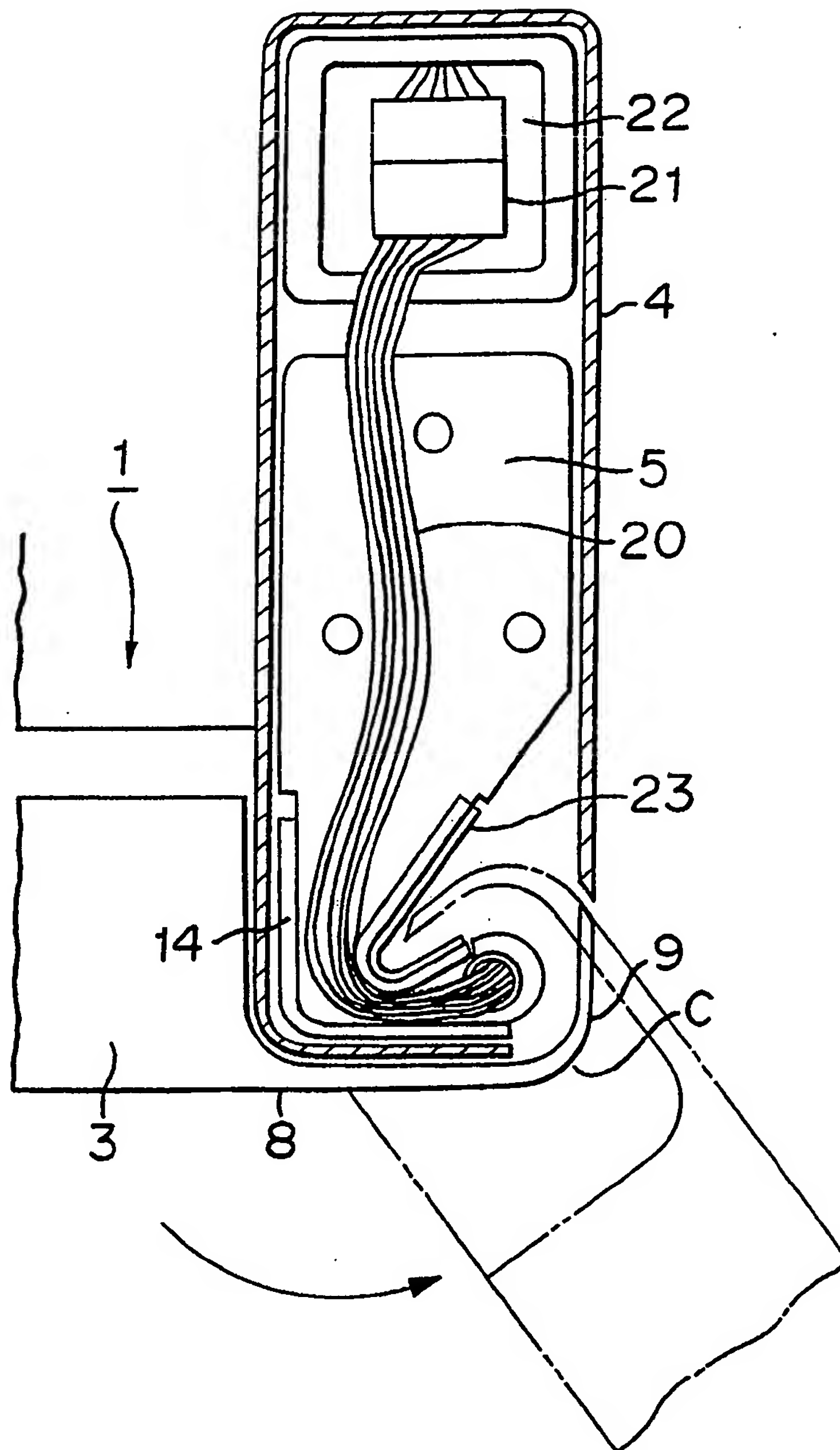


FIGURE 14

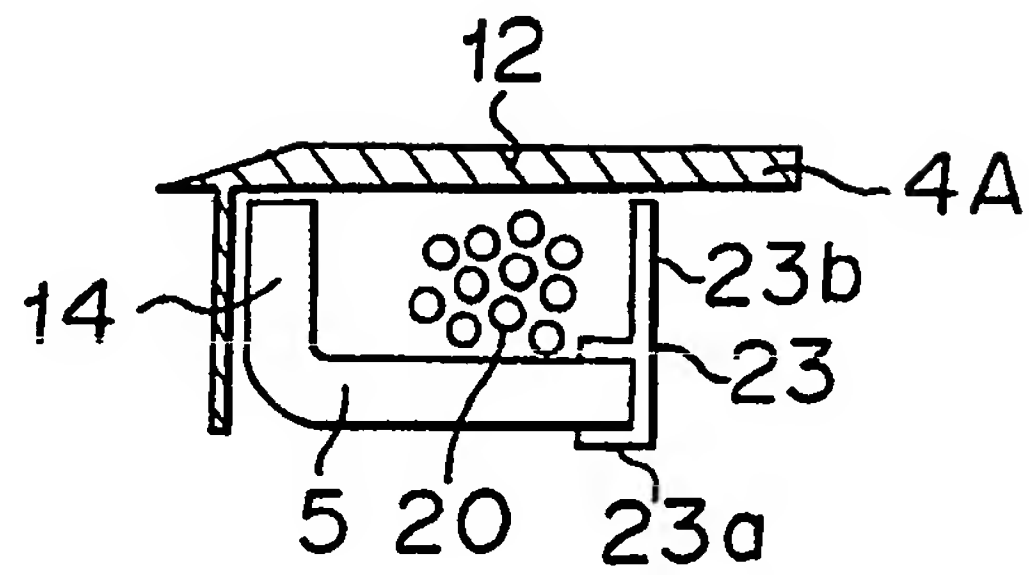


FIGURE 15

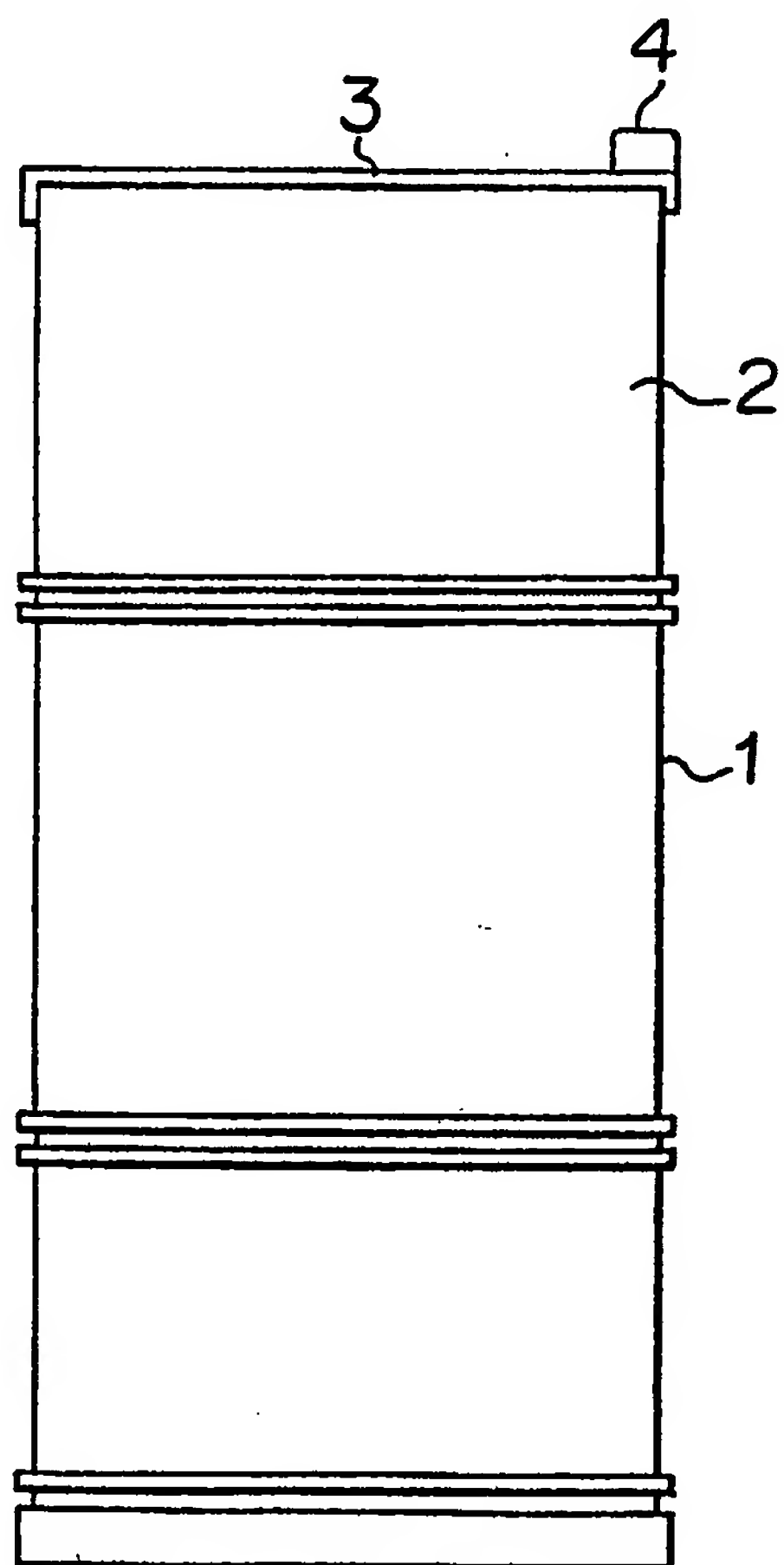


FIGURE 16

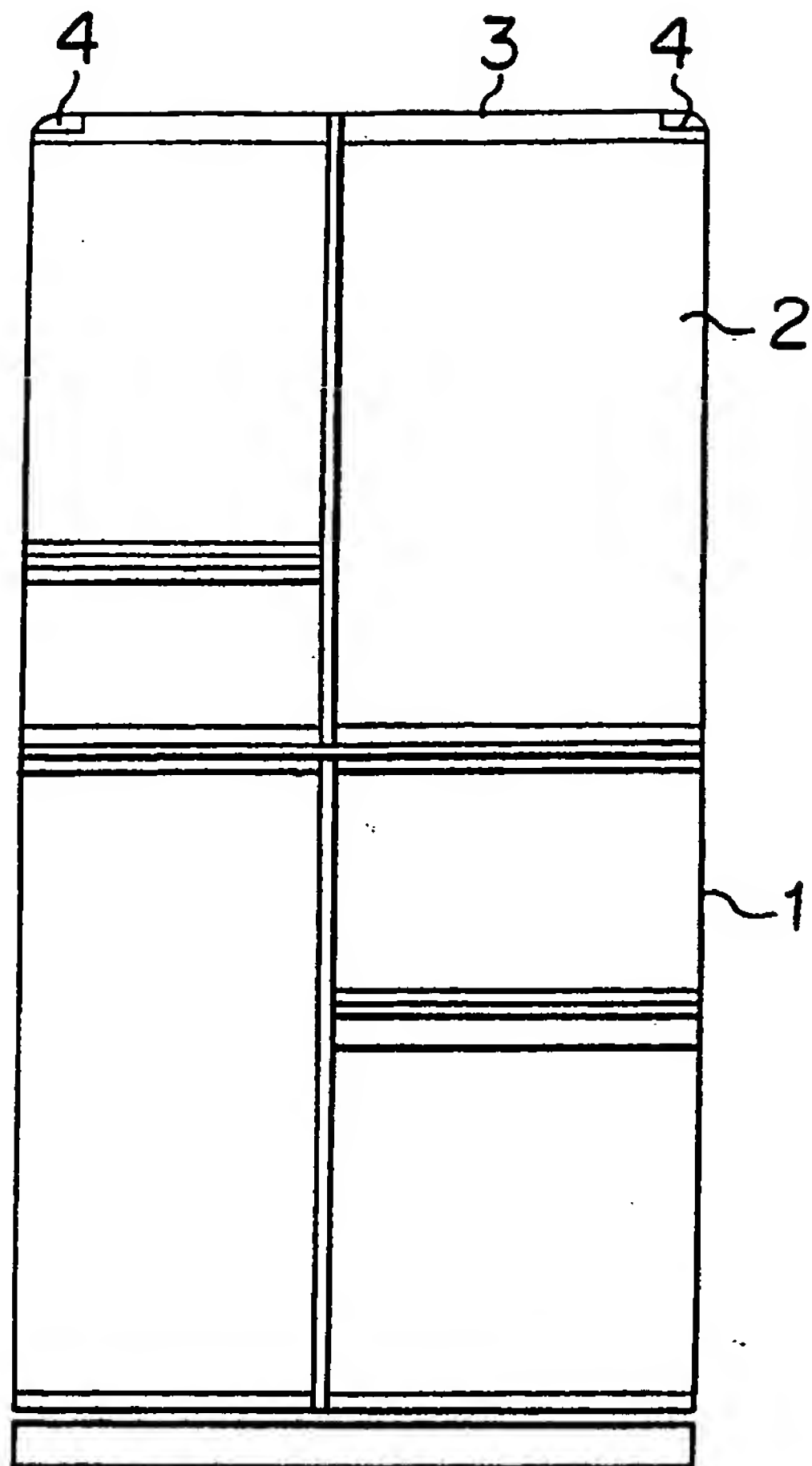
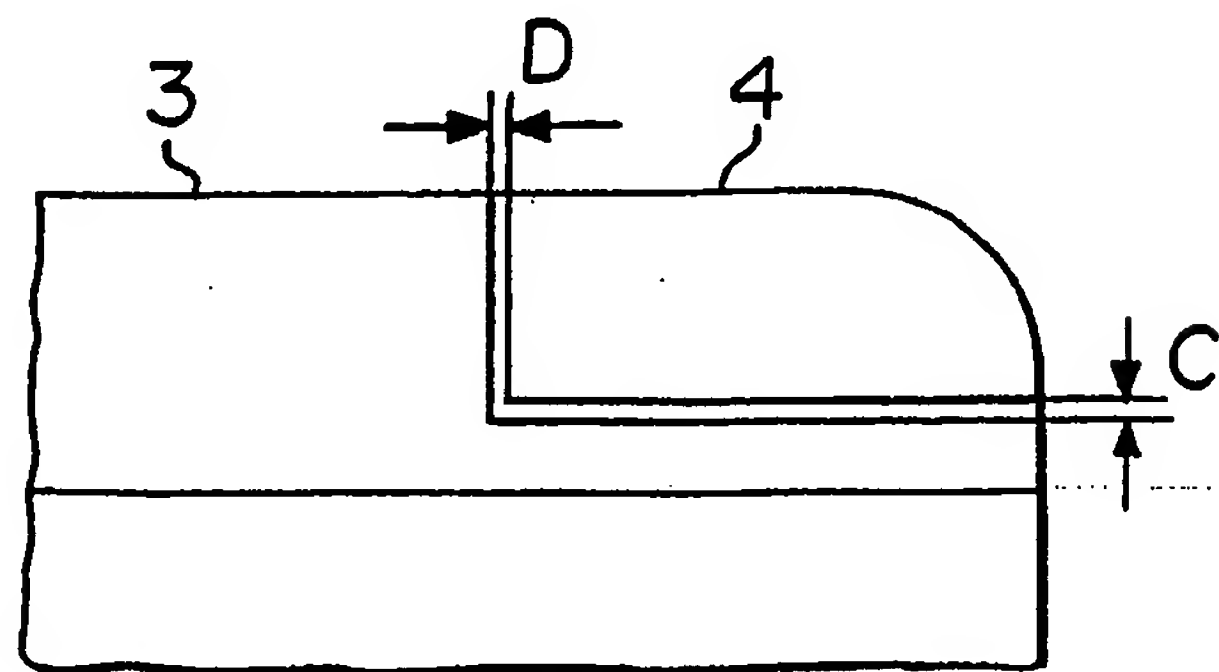


FIGURE 17



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FIGURE 18

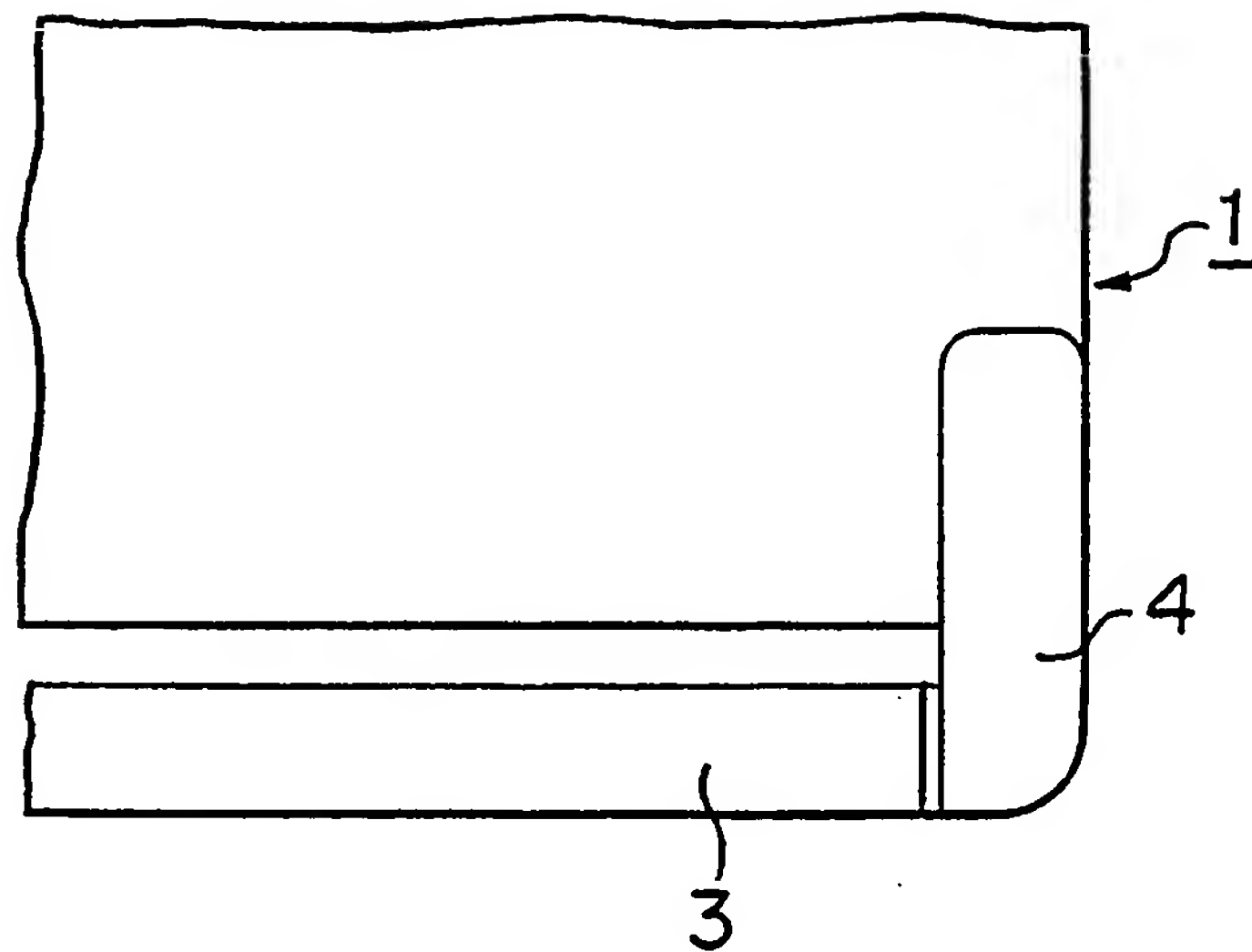


FIGURE 19

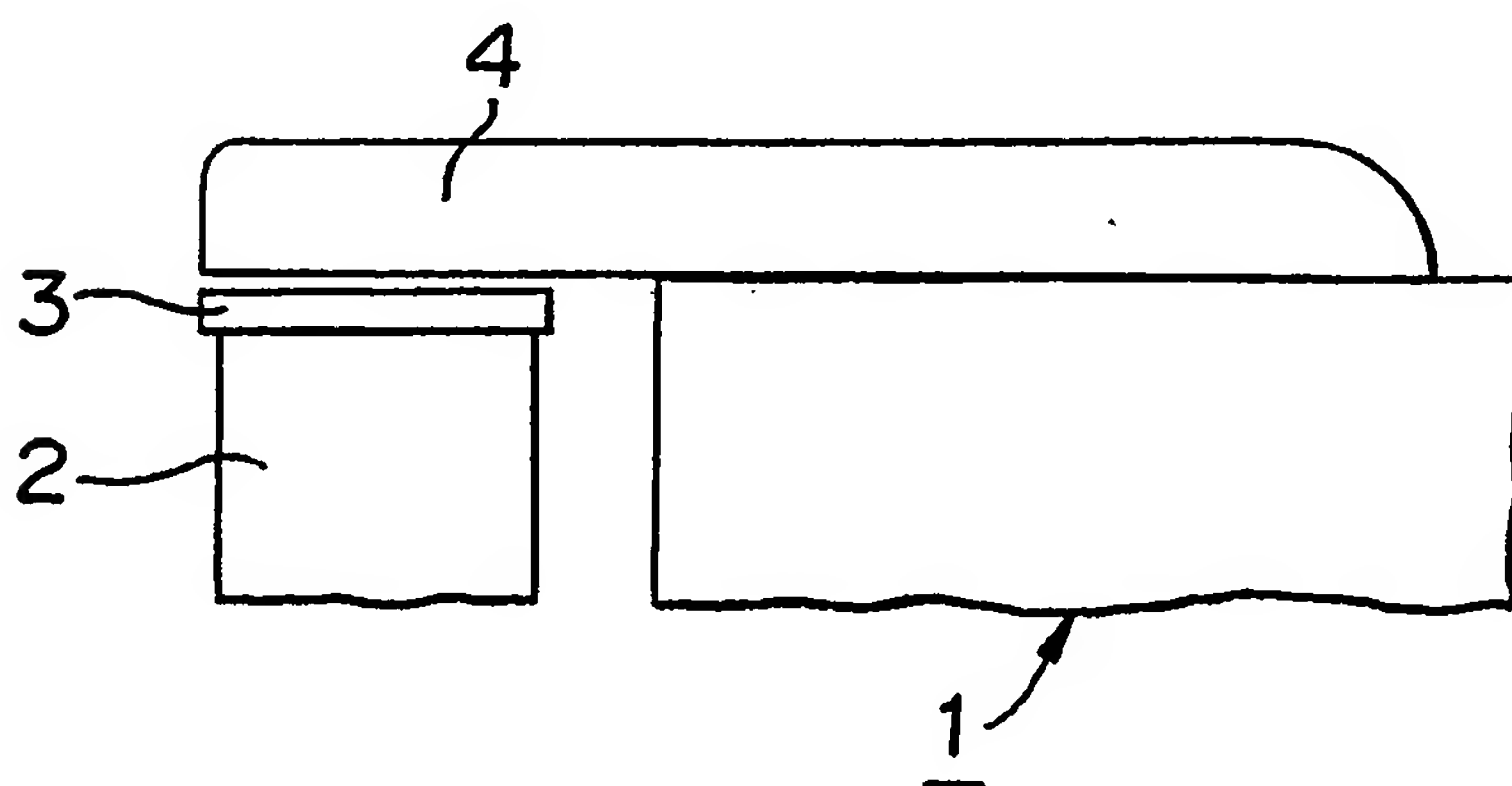


FIGURE 20

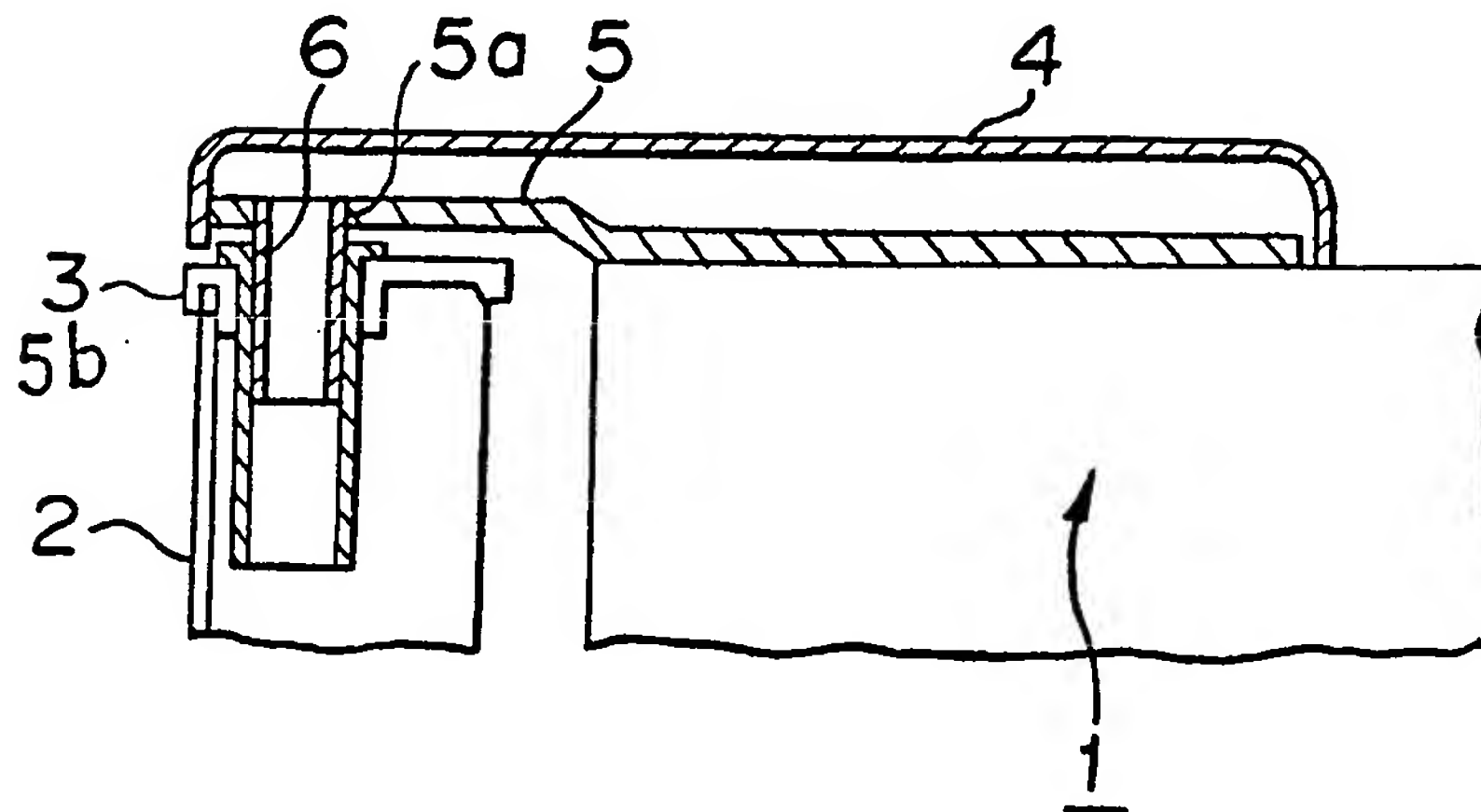
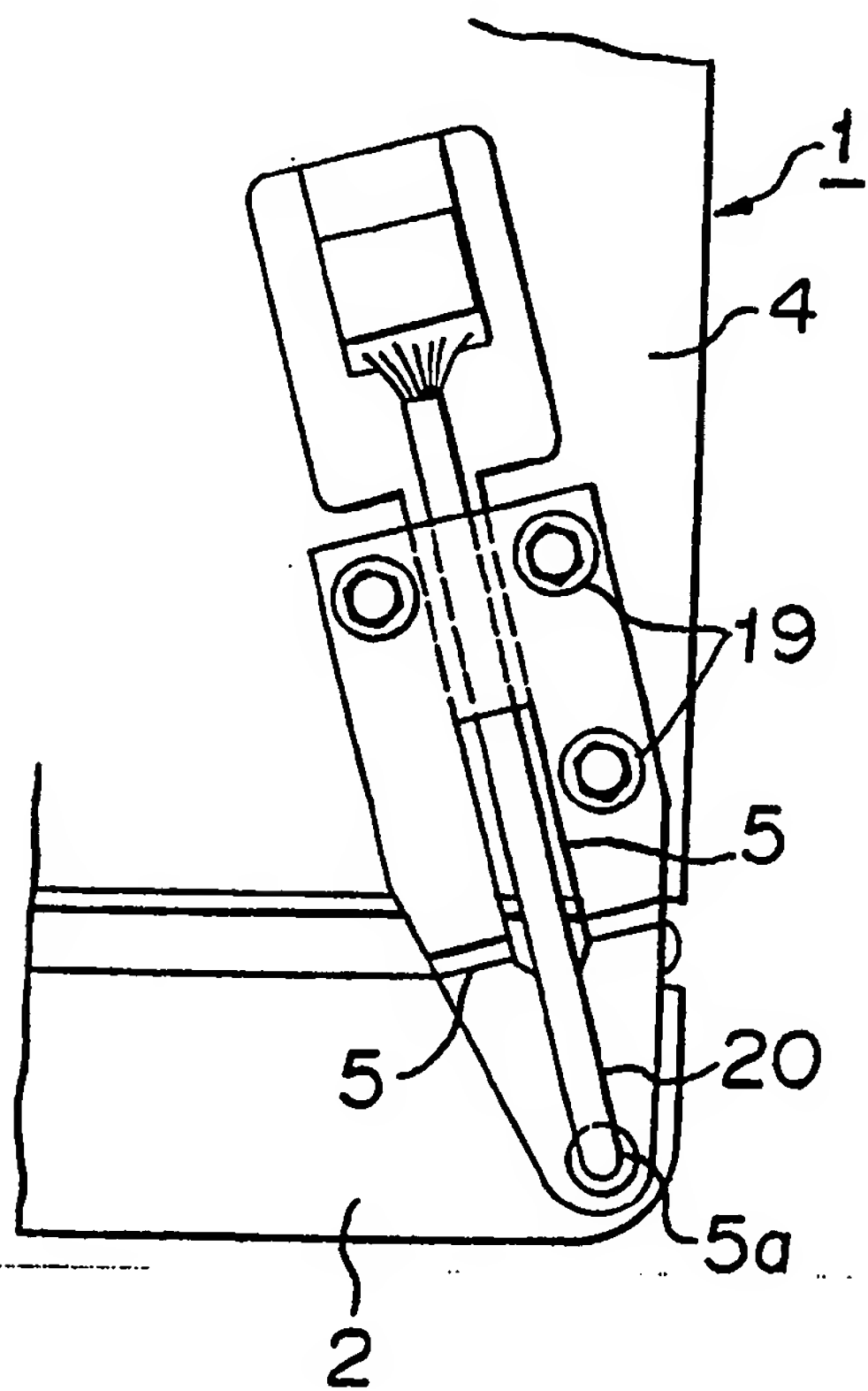


FIGURE 21



- 1 -

HINGE DEVICE

The present invention is related to a hinge device for a refrigerator and the like, and in particular a structure around a hinge.

5 Referring now to Figure 15, there is shown a front view showing a refrigerator with a conventional hinge device which has been disclosed in e.g. Japanese Unexamined Utility Model Publication No. 185587/1984. In Figure 15, reference numeral 1 designates a refrigerator
10 main body. Reference numeral 2 designates a door. Reference numeral 3 designates a door frame. Reference numeral 4 designates a hinge cover which is formed from a thermoplastic resin having a general grade. Referring now to Figures 16 through 21, there is shown another
15 conventional device. In these Figures, reference numeral 5 designates a hinge which is formed from a metallic plate such as an iron plate. Reference numeral 5b designates a hole which is formed in the hinge 5 to pass
20 a lead 20 therethrough. Reference numeral 5a designates an axial hole which is formed the leading edge of the

hinge 5 to hold a shaft 6. Reference numeral 19 designates screws which fix the hinge 5 to the refrigerator main body 1.

The operations of the conventional devices having such structures will be explained.

In the conventional device of Figure 15, the door frame 3 has a top surface flatted, a hinge not shown is arranged to simply support the door 2 from upwardly in a swingable manner, and the hinge is covered by the hinge cover 4. The hinge cover 4 is seen to project from the door frame 3 upwardly. In the conventional device of Figures 16 through 21, a door frame 3 has a stepped portion formed therein around the hinge 5, the hinge 5 is arranged in the stepped portion, and a hinge cover 4 covers the stepped portion to make it inconspicuous. As a result, even if the hinge device is seen from front as shown in the front view of Figure 17 showing the essential parts in an enlarged manner, and even if the hinge device is seen from laterally as shown in the side view of Figure 19 showing the essential parts in an enlarged manner, no parts of the hinge device are seen to project from the door frame 3. A lead 19 with a protective sheath is passed through the hole 5b in the hinge 5 to prevent the lead from being damaged when the door 2 is opened and closed.

The structures of the conventional hinge devices creates problems in that the hinge cover projects from

the door frame, that even if the hinge cover does not project as shown in Figure 17, the presence of gaps C and D between the door frame and the hinge cover makes appearance unsightly, and that if in particular the door is loaded, the size of the gap C could enlarge to make appearance more unattractive as viewed from the front of the door.

It is an object of the present invention to solve the problems of the conventional devices, and to provide a hinge device which is almost free from the projection of a hinge cover or the presence of a gap in a joint as viewed from the front of a door.

It is another object of the present invention to provide a hinge device which is free from unsightly appearance and is excellent in terms of design, and which can ensure to guide and protect a lead in an easy manner.

According to a first aspect of the present invention, there is provided a hinge device comprising a hinge for swingably supporting a door at a main body; a hinge cover for covering the hinge; a door frame forming an upper end section of the door; a stepped portion for swingably supporting the door on the hinge, formed in a corner of the door frame around the hinge, except for a part of a front wall of the door frame and a part of a side wall extending therefrom; and the hinge cover having a top surface and a side surface, the top surface being formed on the substantially same plane as a top surface of the

door frame, and the side surface having a cutout portion
formed on the substantially same plane as the side wall
to correspond to a side surface shape of the stepped
portion, the cutout portion covering the stepped portion,
5 thereby preventing the hinge and the hinge cover from
being exposed at a front end of the door.

According to a second aspect of the present
invention, there is provided a hinge device comprising a
hinge for swingably supporting a door at a main body; a
10 hinge cover for covering the hinge; a door frame forming
an upper end section of the door; a stepped portion for
swingably supporting the door on the hinge, formed in a
corner of the door frame around the hinge, except for a
part of a front wall of the door frame and a part of a
15 side wall extending therefrom; and the hinge cover having
a top surface and a side surface, the top surface being
formed at a higher level than a top surface of the door
frame by substantial plate thickness, the top surface
plate of the hinge cover extending onto the front wall
20 top surface, and the side surface having a cutout portion
formed on the substantially same plane as the side wall
to correspond to a side surface shape of the stepped
portion.

The cutout portion may be formed so that when the
25 door is opened and a rear end of the side wall of the
door frame at the stepped portion is received in a groove
formed in the cutout portion, a minimum gap can be kept

between the door and the groove to prevent the rear end from contacting the groove, thereby making invasion of dust difficult.

According to a third aspect of the present invention,
5 there is provided a hinge device comprising a hinge for swingably supporting a door at a main body; a hinge cover for covering the hinge; a door frame forming an upper end section of the door; a stepped portion for swingably supporting the door on the hinge, formed in a corner of
10 the door frame around the hinge, except for a part of a front wall of the door frame and a part of a side wall extending therefrom; and the hinge cover having a top surface and a side surface, the top surface being formed at a lower level than a top surface of the door frame,
15 the hinge cover having the top surface plate formed with a groove to avoid interference with a rear end of the side wall of the door frame at the stepped portion when the door is opened, and the side surface having a cutout portion formed on the substantially same plane as the
20 side wall to correspond to a side surface shape of the stepped portion, the cutout portion covering the stepped portion.

According to a fourth aspect of the present invention, there is provided a hinge device comprising a
25 hinge for swingably supporting a door at a main body; a hinge cover for covering the hinge; a door frame forming an upper end section of the door; a stepped portion for

swingably supporting the door on the hinge, formed in a corner of the door frame around the hinge, except for a part of a front wall of the door frame and a part of a side wall extending therefrom; and the hinge having a
5 groove formed therein to avoid interference with a rear end of the side wall of the door frame at the stepped portion when the door is opened.

The groove may be formed so that when the door is opened and a rear end of the side wall of the door frame
10 at the stepped portion is received in the groove, a minimum gap can be kept between the door and the groove to prevent the rear end from contacting the groove, thereby making invasion of dust difficult.

The groove which is formed in the hinge to prevent
15 the hinge from interfering with the rear end of the side wall of the door frame at the stepped portion when the door is opened may have a lead guide member arranged on an edge thereof to protect a lead, the lead guide member having a shape similar to that of the groove and
20 extending almost to a bottom surface of the top surface plate of the hinge cover.

The lead guide member may have a semicircular surface contacted with the lead to prevent the lead from being
damaged by the rear end of the side wall of the door
25 frame at the stepped portion when the door is opened.

The hinge cover may have the top surface plate provided with a rib for protecting a lead, the rib

projecting downwardly from the top surface plate to the groove in the hinge, and having a shape similar to that of an edge of the groove which is formed in the hinge to prevent the hinge from interfering with the rear end of the side wall of the door frame at the stepped portion
5 when the door is opened.

The rib may have a semicircular surface contacted with the lead to prevent the lead from being damaged by the rear end of the side wall of the door frame at the
10 stepped portion when the door is opened.

The hinge device which is constructed in accordance with the present invention is almost free from the projection of a hinge cover or the presence of a gap in a joint as viewed from the front when a door is closed, can
15 minimize a gap which is formed in a side surface, can improve appearance in terms of design, can completely conceal a hinge even when the door is opened. In addition, it becomes easy to arrange a lead, and there is no possibility that when opening and closing the door
20 causes the rear end of the side wall of the door frame at the stepped portion to be received in the groove in the hinge, the lead is bit to be damaged.

In drawings:

Figure 1 is a front view showing a refrigerator which
25 is provided with the hinge device according to a first embodiment of the present invention;

Figure 2 is a schematic perspective view showing the

essential parts of the first embodiment;

Figure 3 is a front view showing the essential parts of the first embodiment;

Figure 4 is a side view showing the essential parts
5 of the first embodiment;

Figure 5 is a cross sectional side view showing the structure of the first embodiment;

Figure 6 is a plan view showing the structure of the essential parts of the first embodiment;

10 Figure 7 is a plan view showing the structure of the essential parts of a second embodiment;

Figure 8 is an exploded perspective view showing the essential parts of the hinge device according to the second embodiment;

15 Figure 9 is a plan view showing the structure of the essential parts of the hinge device according to a third embodiment;

Figure 10 is a plan view showing the essential parts of the hinge cover according to the third embodiment;

20 Figure 11 is a cross sectional view showing the essential parts of the hinge device wherein leads are arranged according to the third embodiment;

Figure 12 is an exploded perspective view showing the structure of the essential parts of the hinge device
25 according to a fourth embodiment;

Figure 13 is a cross sectional plan view showing the structure of the essential parts of the hinge device

wherein leads are arranged according to the fourth embodiment;

Figure 14 is a cross sectional view showing the structure of the essential parts of the hinge device
5 wherein the leads are arranged according to the fourth embodiment;

Figure 15 is a front view showing a refrigerator with a conventional hinge device;

Figure 16 is a front view showing a refrigerator with
10 another conventional hinge device;

Figure 17 is an enlarged front view showing the essential parts of the conventional hinge device of Figure 16;

Figure 18 is an enlarged plan view showing the
15 essential parts of the conventional hinge device of Figure 16;

Figure 19 is an enlarged side view showing the essential parts of the conventional hinge device of Figure 16;

20 Figure 20 is a cross sectional side view showing the structure of the essential parts of the conventional hinge device of Figure 16; and

Figure 21 is a plan view of the structure of the essential parts of the conventional hinge device of
25 Figure 16, showing how to arrange a lead.

Preferred embodiments of the present invention will be described with reference to the drawings.

Referring now to Figure 1, there is shown a front view showing a refrigerator which is provided with the hinge device according to a first embodiment of the present invention. Figure 2 is a schematic perspective
5 view showing the essential parts of the hinge device according to the first embodiment. Figure 3 is a front view showing the essential parts. Figure 4 is a side view showing the essential parts. Figure 5 is a cross sectional side view showing the structure of the
10 essential parts. Figure 6 is a plan view showing the structure of the essential parts.

Like reference numerals in these Figures designate parts identical or corresponding to the ones of the conventional devices.

15 In Figures 1 through 6, reference numeral 4A is a hinge cover. Reference numeral 7 designates a cutout stepped portion (hereinbelow, referred to as the stepped portion) which is formed in a recessed shape in a right side corner C of a door frame 3, except for a part of a
20 front wall 8 of the door frame 3 and a part of a side wall 9 extending therefrom. The door frame 3 forms an upper end section of a door 2. In the stepped portion 7 is arranged a hinge 5. The hinge 5 is formed with an axial hole 5a and a shaft 6 to swingably support the door
25 2. Reference numeral 9a designates a rear end of the side wall 9. Reference numeral 10 designates a side plate of the hinge cover 4A, which has a cutout 11 formed

therein to correspond to the shape of the side wall 9. Reference numeral 12 designates a top surface plate of the hinge cover 4A, which is provided at a higher level than the door frame 3 by substantial plate thickness, which has the leading end extended along a top surface of the door frame 3, and which is formed to accommodate with the cutout 11 swung parts of the front wall 8 and the side wall 9 under the top surface plate 12 of the hinge cover 12 when the door 2 is opened. Reference numeral 13 designates a groove which is formed in the hinge 5 fixed to a main body 1, and which is cut deep into in such a shape that the groove is prevented from interfering with a swing track of the rear end 9a of the side wall 9. Reference numeral 14 designates a flange which is formed at a front portion of the hinge 5 in a substantial L-character shape in section, and which reinforces the strength of a portion which the groove 13 is formed therein. Reference numeral 15 designates a hole which swingably supports the shaft 6 supported by the hinge 5, and which is formed in the door frame 3. Reference numeral 16 designates a gasket. Reference numeral 17 designates an inner casing. Reference numeral 18 designates an inside plate of the door.

The first embodiment will be further explained based
25 on the basic structure stated above. The door frame 3
has the stepped portion 7 formed around the hinge 5, and
the stepped portion 7 has the hinge 5 mounted thereon by

screws (not shown). The hinge cover 4A has the top surface plate 12 located at a higher level than the top surface of the door frame 3 by substantial plate thickness, the hinge cover has the side surface plate 10
5 formed with the cutout 11 to correspond to the shape of the side wall 9 of the door frame 3 at the stepped portion 7, and the hinge cover 4A is fitted to a side surface of the hinge 5. As shown in Figures 1 through 4, the hinge device according to the first embodiment have
10 such appearance that the hinge cover 4A is seen to project from the top surface of the door frame 3 by a size A of the substantial plate thickness of the top surface plate 12 as viewed from the front, that a joint between the stepped portion 7 and the cutout 11 is seen
15 to correspond to the shape of the side wall 9 as viewed from laterally, and that a joint between the door frame 3 and the hinge cover 4A is seen as viewed from the top. The projected parts and the joints are minimized as viewed from the respective directions. The hinge device
20 has extremely excellent appearance, and the appearance is remarkably improved in comparison with the conventional devices except for the appearance as viewed from laterally.

When the door 2 is opened, the rear end 9a of the
25 side wall 9 of the door frame 3 is swung about the shaft 6 as shown by chain-lines in Figure 6, and the rear end 9a moves to a position closest to the inner end of the

groove 13 in the hinge 5 until the door is stopped by a door stopper (not shown) which is attached to a lower portion of the door 2. At that time, a part of the front wall 8 which is located around the stepped portion 7 is stopped just before that part has hit against a front end 11a of the cutout 11 of the hinge cover 4A. The hinge 5 is concealed by the front wall 8 and the side wall 9 of the door frame 3 as viewed from outside, and by the side surface plate 10 of the hinge cover 4A as viewed from inner side, thereby preventing excellent appearance. In addition, the strength of the door 2 is sufficiently reinforced by the flange 14 to withstand a great load applied to the door 2, the flange 14 being formed in the L character shape in section around the hinge 5.

Although in the first embodiment the hinge device is shown to be arranged in the upper right corner of the door 2, the hinge device may be arranged on the left side or in a lower corner of the door 2, which can offer advantage similar to the first embodiment.

Now, the hinge device according to a second embodiment of the present invention will be described in detail, referring to a schematic perspective view showing the essential parts of the refrigerator of Figure 8, and a schematic plan view of the essential parts of Figure 7.

Like reference numerals designate parts identical or corresponding to those of the first embodiment.

In Figure 8, reference numeral 4B designates a hinge

cover which has a top surface S_2 formed on the substantially same plane as a top surface S_1 of a door frame 3, or formed to be slightly lower than the top surface S_1 . Reference numeral 4b designates an arched groove which is formed in a top surface plate 12 of the hinge cover 4B to prevent a rear end 9a of a side wall 9 from interfering with the top surface plate 12 of the hinge cover 4B when a door 2 is opened.

In accordance with the structure of the second embodiment, an upper end portion of the rear end 9a of the side wall 9 of the door frame 3 which is swung about a shaft 6 by opening the door 2 and is received into a groove 13 formed in a hinge 5 is introduced into the groove 4b of the hinge cover 4B as shown in Figure 7. Such arrangement allows the door 2 to be opened and closed without interference. Because other features of the second embodiment are similar to those of the first embodiment, explanation of those features will be omitted for the sake of simplicity.

In Figure 9, there is shown a plan view showing the structure of the essential parts of the hinge device according to a third embodiment of the present invention. In Figure 10, there is shown a partial plan view showing the hinge cover. In Figure 11, there is shown a cross sectional view showing the essential parts of the hinge device wherein leads are arranged in accordance with the third embodiment.

Like reference numerals designate parts identical or corresponding to those of the first and second embodiments.

In Figures 9 through 11, reference numeral 4C
5 designates a hinge cover which has a top surface plate 12 formed downwardly from a bottom surface thereof, the rib 4r being formed to correspond to a groove 13 formed in a hinge 5 and extending to an inner edge of the groove 13. Reference numeral 21 designates a connector which
10 connects leads 20 to a power source. Reference numeral 22 designates a connector housing.

In accordance with the structure of the third embodiment, the leads 20 can be protected by the rib 4r at its peripheral surface to be positively prevented from
15 being damaged by a rear end 9a of a side wall 9 when a door 2 is opened.

In Figure 12, there is shown a perspective view showing the structure of the essential parts of a hinge device which has leads arranged therein in accordance
20 with a forth embodiment. In Figure 13, there is shown a plan view showing the structure of the essential parts. In Figure 14, there is shown a cross sectional view showing the structure of the essential parts of the hinge device which has a lead guide member mounted thereto.

25 In Figures 12 through 14, reference numeral 23 designates a lead guide member which includes a fitted holder 23a and a partition wall 23b, the fitted holder

23a being engaged and supported by and along a groove 13 formed in a hinge 5, and the partition wall 23b extending upwardly from the fitted holder 23a in a substantially vertical direction.

5 In the forth embodiment, the lead guide member 23 is supported by the fitted holder 23a at the inner edge of the groove 13 in the hinge 5 and the partition wall 23b defines an arranging section for the leads 20. As a result, the leads 20 can not only be safely protected
10 from damage when a door is opened and closed, but also be guided for arrangement to facilitate the arrangement of the leads 20.

As explained in detail, the present invention allows the appearance of the hinge device for mounting the door
15 to the main body to make extremely excellent, and commercial value to be increased. In addition, the present invention can prevent the leads arranged in the hinge device from being damaged when the door is opened and closed. As a result, the leads can dispense with a
20 protective sheath to decrease the cost of materials and a processing cost including lead arrangement.

Although explanations of the embodiments have been made in the case wherein the hinge 5 is formed from a metallic plate, and the hinge covers 4A, 4B and 4C are
25 formed a thermoplastic resin having a general grade, the materials for the hinge and the hinge cover are not limited to such materials. If an engineering plastic

material having great acceptable shearing stress is used to form the hinge and hinge cover as one unit, a small sized hinge device having great geometrical moment of inertia can be obtained by increasing wall thickness and adding a reinforced rib. Advantages offered by such hinge device are similar or superior to the embodiments.

Although in the embodiments the hinge 5 is made of a metallic plate and the lead guide member 23 is prepared as a different part, an engineering plastic material may be used to form the hinge 5 and the lead guide member 23 as one unit.

CLAIMS:

1. A hinge device comprising:

a hinge for swingably supporting a door at a main body;

5 a hinge cover for covering the hinge;

a door frame forming an upper end section of the door;

a stepped portion for swingably supporting the door on the hinge, formed in a corner of the door frame around the hinge, except for a part of a front wall of the door frame and a part of a side wall extending therefrom; and

the hinge cover having a top surface and a side surface, the top surface being formed on the substantially same plane as a top surface of the door frame, and the side surface having a cutout portion formed on the substantially same plane as the side wall to correspond to a side surface shape of the stepped portion, the cutout portion covering the stepped portion, thereby preventing the hinge and the hinge cover from being exposed at a front end of the door.

2. A hinge device comprising:

a hinge for swingably supporting a door at a main body;

a hinge cover for covering the hinge;

25 a door frame forming an upper end section of the door;

a stepped portion for swingably supporting the door

on the hinge, formed in a corner of the door frame around the hinge, except for a part of a front wall of the door frame and a part of a side wall extending therefrom; and

the hinge cover having a top surface and a side
5 surface, the top surface being formed at a higher level than a top surface of the door frame by substantial plate thickness, the top surface plate of the hinge cover extending onto the front wall top surface, and the side surface having a cutout portion formed on the
10 substantially same plane as the side wall to correspond to a side surface shape of the stepped portion.

3. A hinge device according to Claims 1 or 2, wherein the cutout portion is formed so that when the door is opened and a rear end of the side wall of the door frame
15 at the stepped portion is received in a groove formed in the cutout portion, a minimum gap can be kept between the door and the groove to prevent the rear end from contacting the groove, thereby making invasion of dust difficult.

20 4. A hinge device comprising:

a hinge for swingably supporting a door at a main body;

a hinge cover for covering the hinge;

a door frame forming an upper end section of the
25 door;

a stepped portion for swingably supporting the door on the hinge, formed in a corner of the door frame around

the hinge, except for a part of a front wall of the door frame and a part of a side wall extending therefrom; and

the hinge cover having a top surface and a side surface, the top surface being formed at a lower level than a top surface of the door frame, the hinge cover having the top surface plate formed with a groove to avoid interference with a rear end of the side wall of the door frame at the stepped portion when the door is opened, and the side surface having a cutout portion formed on the substantially same plane as the side wall to correspond to a side surface shape of the stepped portion, the cutout portion covering the stepped portion.

5. A hinge device comprising:

a hinge for swingably supporting a door at a main body;

a hinge cover for covering the hinge;

a door frame forming an upper end section of the door;

a stepped portion for swingably supporting the door on the hinge, formed in a corner of the door frame around the hinge, except for a part of a front wall of the door frame and a part of a side wall extending therefrom; and the hinge having a groove formed therein to avoid interference with a rear end of the side wall of the door frame at the stepped portion when the door is opened.

6. A hinge device according to Claims 4 or 5, wherein the groove is formed so that when the door is opened and

a rear end of the side wall of the door frame at the stepped portion is received in the groove, and a minimum gap can be kept between the door and the groove to prevent the rear end from contacting the groove, thereby making invasion of dust difficult.

7. A hinge device according to Claims 4 or 5, wherein the groove which is formed in the hinge to prevent the hinge from interfering with the rear end of the side wall of the door frame at the stepped portion when the door is opened has a lead guide member arranged on an edge thereof to protect a lead, the lead guide member having a shape similar to that of the groove and extending almost to a bottom surface of the top surface plate of the hinge cover.

8. A hinge device according to Claim 7, wherein the lead guide member has a semicircular surface contacted with the lead to prevent the lead from being damaged by the rear end of the side wall of the door frame at the stepped portion when the door is opened.

9. A hinge device according to Claims 4 or 5, wherein the hinge cover has the top surface plate provided with a rib for protecting a lead, the rib projecting downwardly from the top surface plate to the groove in the hinge, and having a shape similar to that of an edge of the groove which is formed in the hinge to prevent the hinge from interfering with the rear end of the side wall of the door frame at the stepped portion when the door is

opened.

10. A hinge device according to Claim 9, wherein the rib
has a semicircular surface contacted with the lead to
prevent the lead from being damaged by the rear end of
5 the side wall of the door frame at the stepped portion
when the door is opened.

11. A hinge device, substantially as herein described
with reference to Figures 1 to 6, Figures 7 and 8,
Figures 9 to 11, or Figures 12 to 14 of the accompanying
drawings.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition K) E2F (FPA, FPX, FCM)

(ii) Int CL (Edition 5) E05D; F25D

Search Examiner

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Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

7 MAY 1992

Documents considered relevant following a search in respect of claims

1-11

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|--|-------------------------|
| | NONE | |

CLP

| Category | Identity of document and relevant passages | Relevant to claim(s) |
|----------|--|----------------------|
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